

# The Water-Cooled Medium-Voltage Drive of Choice

Maximum efficiency, power quality, and protection.



## ROBICON Perfect Harmony

Answers for industry.

**SIEMENS**

# ROBICON Perfect Harmony

## Water-Cooled Proven Performance



The ROBICON Perfect Harmony™ water-cooled medium-voltage Variable Frequency Drives (VFDs) from Siemens are designed to provide maximum power efficiency, process availability, and versatility to a range of demanding applications.

The ROBICON Perfect Harmony water-cooled WCIII and HV systems deliver outstanding core characteristics and significant competitive advantages – such as high-power quality input and output, along with optimal heat dissipation in order to prevent potential shutdowns due to overheating.

Adding to the versatility of the ROBICON Perfect Harmony drive are the available water-cooled WCIII and HV systems. Redundant cooling pumps are standard for all water-cooled units.

These fully integrated Variable Frequency Drives in a single lineup include the isolation transformer, power electronics, and control and cooling systems. There is no customer site cabling required to connect the assembled sections, and all components are readily accessible. The cells can be pulled out easily for maintenance due to their reduced weight and front-accessible bolted connection. Additionally, a custom-designed cell lifter holds the cell in place while being removed or reinstalled. With these design features in place, a full cell replacement only takes thirty minutes.

### Features and Benefits

The ROBICON Perfect Harmony water-cooled VFD at a glance

- Reliable water-cooled design
- Clean power input (meets IEEE-519)
- 0.95 power factor throughout speed range
- Near perfect sinusoidal output allows retrofit to existing motors
- Multilevel PWM technology means no special motor is required
- Can be applied to induction, synchronous and wound rotor motors
- Control drive tool (Windows interface)
- Proven Perfect Harmony topology
- High-availability options, including Advanced Cell Bypass and ProToPS™
- Standard redundant cooling pumps



### **Advanced Cell Bypass**

The Advanced Cell Bypass feature enables the ROBICON Perfect Harmony water-cooled drives to remain operational in the event of a cell failure by bypassing the faulted cell. Depending on the process requirement and the Variable Frequency Drive configuration, a cell fault could have minimal or no impact on the process; the motor output power quality remains within defined guidelines.

### **ProToPS™ Process-First Mentality**

ROBICON Perfect Harmony's Process Tolerant Protection Strategy (ProToPS) provides a hierarchical system of warnings that keep ROBICON Perfect Harmony water-cooled drives on line and in control of your process, while drive trips and process interruptions only occur in extreme circumstances. ProToPS allows time for the operator to evaluate a VFD disturbance and respond appropriately to avoid system shutdown.

# Technical Data:

At a glance



## Specification

Line supply connection

- Line voltage: 2.3 to 13.8 kV +10% / -5%
- Frequency: 50/60 Hz +/- 2.5/3.0 Hz
- Line power factor: > 0.95
- Top or bottom cable entry

## Motor connection

- Motor voltages: 2.3 to 13.8 kV
- Top or bottom cable entry

## Power quality

- Converter efficiency (without transformer): > 98.5%
- Total VFD system efficiency: > 96.5%

## Auxiliary voltage

- 380 V / 50 Hz, 400 V / 50 Hz, 415 V / 50 Hz
- 460 V / 60 Hz, 480 V / 60 Hz, 575 V / 60 Hz

## Line-side rectifier

- Integrated isolation copper transformer
- Minimum 18-pulse diode rectified

## Motor-side inverter

- Multilevel PWM topology
- LV-IGBT power cells in WCIII and 3.3 kV-IGBT power cells in HV systems

## Cooling

- Water-cooling with redundant pumps

## Degree of protection

- NEMA 12 / IP54 power cabinets
- NEMA 1 / IP21 low-voltage cabinets

Higher ratings optional

## Environmental conditions

- Ambient air temperature: -5-40°C (32-104°F), up to 50°C (122°F) with derating if air/water HEX are used
- Customer raw cooling water temperature: 5-35°C (41-95°F) if water/water HEX is used
- Installation altitude: up to 1000 m (3300 ft)
- Humidity: < 95% without moisture condensation
- Pollution Degree 2 or better

#### Safety features include:

- Short circuit and ground fault protection
- Overcurrent, over- and undervoltage protection
- Loss of line voltage protection
- Overtemperature protection (VFD and motor)
- Overspeed and stall protection (motor)
- Monitoring of cooling circuit
- Self-diagnosis of control and power cells



#### Control

- V/Hz control without speed encoder
- Vector control with and without speed encoder (optional)
- Speed accuracy:  $\pm 0.1\%$  with speed encoder,  $\pm 0.5\%$  without speed encoder
- Torque accuracy:  $\pm 2\%$
- Field weakening range 1:3
- Maximum output frequency: 330 Hz (above 167 Hz with derating)

#### Control I/O

- Analog inputs: 3\*
- Analog outputs: 2\*
- Digital inputs: 20\*
- Digital outputs: 16\*
- Speed encoder (optional)
- Communication: Modbus, optional: DeviceNet, PROFIBUS, Control Net\*

#### Third-party certification

- CE Mark
- CSA

#### Selection of additional options

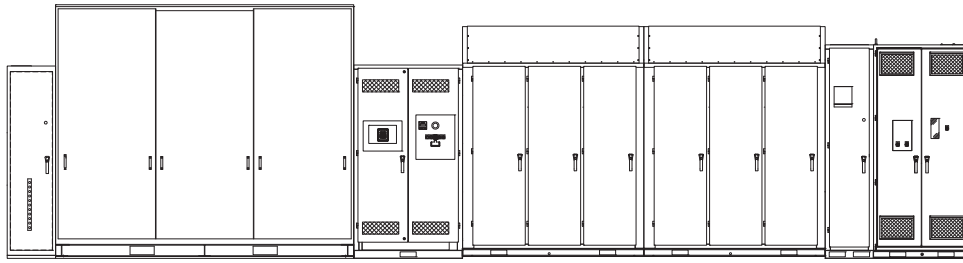
- ProToPS process-tolerant protection system
- Advanced cell bypass
- EMC filter
- Anticondensation heater
- Keyed interlock systems
- Additional I/O modules
- Serial communication with various bus systems
- Control and display instruments in the door
- Ethernet and/or RS232 port connectors
- PT100 monitoring (motor windings and bearings)
- Input and output earthing switch

\* additional using optional modules

Output Current [A]	Type Rating [kVA]	Shaft Output		Transformer [kVA]	Order Number (MLFB)	Generation	No. of Cells	Outline
		[kW]	[hp]					
<b>Motor voltage 3.3 kV</b>								
615	3510	2984	4000	4000	6SR3152-0[B44-0][[]]0	WCIII	9	A
880	5025	4271	5726	6000	6SR3152-0[B46-0][[]]0	WCIII	9	A
1250	7140	6067	8133	8500	6SR3152-0[C48-5][[]]0	WCIII	9	A
<b>Motor voltage 4.0/4.16 kV</b>								
570	3950	3357	4500	4500	6SR3152-0[B44-5][[]]0	WCIII	9	A
880	6095	5177	6940	7000	6SR3152-0[B47-0][[]]0	WCIII	9	A
1250	8660	7354	9858	10000	6SR3152-0[C51-0][[]]0	WCIII	9	A
<b>Motor voltage 4.6/4.8 kV</b>								
475	3950	3357	4500	4500	6SR3152-1[B44-5][[]]0	WCIII	12	A
880	7315	6213	8328	8500	6SR3152-1[B48-5][[]]0	WCIII	12	A
1250	10390	8825	1830	12000	6SR3152-1[C51-2][[]]0	WCIII	12	A
<b>Motor voltage 6.0 kV</b>								
590	6150	5222	7000	7000	6SR3152-2[B47-0][[]]0	WCIII	15	A
880	9140	7766	10410	11000	6SR3152-2[B51-1][[]]0	WCIII	15	A
1250	12990	11031	14787	15000	6SR3152-2[C51-5][[]]0	WCIII	15	A
<b>Motor voltage 6.6 kV</b>								
615	7030	5968	8000	8000	6SR3152-2[B48-0][[]]0	WCIII	15	A
880	10055	8542	11451	12000	6SR3152-2[B51-2][[]]0	WCIII	15	A
1250	14285	12134	16266	17000	6SR3152-2[C51-7][[]]0	WCIII	15	A
385	4390	3730	5000	5000	6SR2142-0[A45-0][[]]0	HV	9	B
500	5715	4854	6506	7000	6SR2142-0[A47-0][[]]0	HV	9	B
800	9140	7766	10410	11000	6SR2142-0[B51-1][[]]0	HV	9	B
1400	16000	13590	18218	20000	6SR2142-0[C52-0][[]]0	HV	9	B
<b>Motor voltage 6.9/7.2 kV</b>								
564	7030	5968	8000	8000	6SR3152-3[B48-0][[]]0	WCIII	18	A
880	10970	9319	12492	13000	6SR3152-3[B51-3][[]]0	WCIII	18	A
1250	15585	13237	17744	18000	6SR3152-3[C51-8][[]]0	WCIII	18	A
352	4390	3730	5000	5000	6SR2142-0[A45-0][[]]0	HV	9	B
500	6235	5295	7098	7000	6SR2142-0[A47-5][[]]0	HV	9	B
800	9975	8472	11356	12000	6SR2142-0[B51-2][[]]0	HV	9	B
1400	17455	14828	19874	20000	6SR2142-0[C52-0][[]]0	HV	9	B
<b>Motor voltage 10/11 kV</b>								
253	4830	4103	5500	5500	6SR2142-2[A45-5][[]]0	HV	15	B
500	9525	8089	10844	11000	6SR2142-2[A51-1][[]]0	HV	15	B
800	15240	12943	17350	18000	6SR2142-2[B51-8][[]]0	HV	15	B
1400	26670	22651	30363	32000	6SR2142-2[C53-2][[]]0	HV	15	B
<b>Motor voltage 13.2/13.8 kV</b>								
258	6150	5222	7000	7000	6SR2142-3[A47-0][[]]0	HV	18	B
500	11950	10149	13604	14000	6SR2142-3[A51-4][[]]0	HV	18	B
800	19120	16238	21766	22000	6SR2142-3[B52-2][[]]0	HV	18	B
1400	33460	28416	38091	40000	6SR2142-3[C54-0][[]]0	HV	18	B

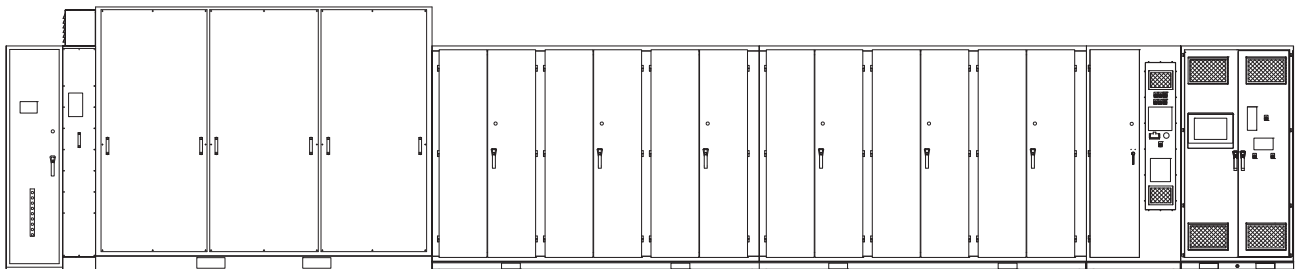
NOTE: Above table represents only a subset of drive configurations.

**A: WCIII**



Output Voltage	Motor		WCIII Overall System Dimensions					
			Cabinet Length		Cabinet Height		Cabinet Depth	
	[kW]	[hp]	mm	inch	mm	inch	mm	inch
3.3 kV	2984 ~ 4850	4000 ~ 6500	9400	370	2700	106	1680	66
	5220 ~ 6067	7000 ~ 8500	9600	378	2920	115	1680	66
4.0/4.16 kV	2984 ~ 4850	4000 ~ 6500	9140	360	2700	106	1680	66
	5220 ~ 7460	7000 ~ 10000	9600	378	2920	115	1680	66
4.6/4.8 kV	2984 ~ 3360	4000 ~ 4500	10110	398	2700	106	1680	66
	3730 ~ 7090	5000 ~ 9500	10310	406	2920	115	1680	66
	7460 ~ 8950	10000 ~ 12000	10470	412	2920	115	1780	70
6 kV	2984 ~ 4850	4000 ~ 6500	10800	425	2700	106	1680	66
	5220 ~ 7090	7000 ~ 9500	11100	433	2920	115	1680	66
	7460 ~ 11190	10000 ~ 15000	11150	439	2920	115	1780	70
6.6 kV	2984 ~ 4850	4000 ~ 6500	10800	425	2700	106	1680	66
	5220 ~ 7090	7000 ~ 9500	11100	433	2920	115	1680	66
	7460 ~ 12680	10000 ~ 17000	11150	439	2920	115	1780	70
6.9/7.2 kV	2984 ~ 7090	4000 ~ 9500	11890	468	2920	115	1680	66
	7460 ~ 9700	10000 ~ 13000	12040	474	2920	115	1780	70
	10444 ~ 13430	14000 ~ 18000	12140	478	3180	125	1930	76

**B: HV**



Output Voltage	Motor		HV Overall System Dimensions					
			Cabinet Length		Cabinet Height		Cabinet Depth	
	[kW]	[hp]	mm	inch	mm	inch	mm	inch
6.6 kV	3730 ~ 5220	5000 ~ 7000	10340	407	2670	105	1680	66
	5600 ~ 7460	7500 ~ 10000	11530	454	2920	115	1680	66
	8200 ~ 13430	11000 ~ 18000	11690	460	2920	115	1830	72
6.9/7.2 kV	3730 ~ 5600	5000 ~ 7500	10540	415	2920	115	1680	66
	5970 ~ 8200	8000 ~ 11000	11530	454	2920	115	1680	66
	5970 ~ 8200	8000 ~ 11000	11680	460	2920	115	1830	72
10/11 kV	3730 ~ 8200	5000 ~ 11000	13080	515	2920	115	1780	70
	8950 ~ 13430	12000 ~ 18000	14730	580	2920	115	1780	70
	14170 ~ 16400	19000 ~ 22000	14830	584	3180	125	1930	76
	> 16400	> 22000	Consult Factory		Consult Factory		Consult Factory	
13.2/13.8 kV	3730 ~ 10440	5000 ~ 14000	14330	564	3180	125	1930	76
	11190 ~ 16400	15000 ~ 22000	16300	642	3180	125	1930	76
	> 16400	> 22000	Consult Factory		Consult Factory		Consult Factory	

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